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Dr. Walter R. Loewe (New York): After carefully analyzing the reports of Drs. Ruedemann and Zeiter on the use of diathermy in ophthalmology, I am further convinced that we are but on the threshold of greater achievement in the field of this physical therapeutic agent, which is more and more proving its value in ocular infections. Of prime importance in the treatment of infections in and about the orbit is that it is necessary to have an exact knowledge of the output of the individual apparatus and the reaction of each individual patient after an initial treatment well below what is considered a unit of treatment, which I place at 15 minutes and at comfortable heat sensation. In view of the fact, that there is no standardized technic, and that individuals and machines vary as to output and reaction, extreme caution should be taken to stay within the point of tolerance, and emphasis should be laid on the word "comfortable." In other words, it is definitely hazardous to proceed beyond the point of comfort. If heat beyond this point is obtained, tissues which are already weakened by infection may be damaged. Such damage, as we already know, can be permanent. The output of each instrument being different and the toleration of heat varying, renders standardization almost impossible at this time. In order that the patient be induced to continue the necessary series of diathermy treatments, first and foremost he should be made comfortable, by not having excessively long or intense treatments. This too, is a factor in safety. Obviously the earlier in the course of infection the treatment is instituted (within the range above mentioned) the better the results will be. I noted with keen interest that in this series of cases all other approved methods in ophthalmology were used in addition to diathermy. Diathermy has proved the best method to date in the management of deep vascular disturbances of the eye, but too much is not to be expected or hoped for in these conditions. Of course, in inflammatory processes a greater measure of vision can be retained because deep heat, if applied sufficiently early, has an inhibiting effect on the destructive processes which affect these delicate tissues.

In the treatment of conditions involving the anterior segment of the eye, such as episcleritis, iritis, and painful corneal con-

ditions of the herpetic group, we are early rewarded with a definite diminution of pain, and by increasing the circulation the processes of repair are soon instituted. Too much has been looked for in diathermy as a cure for many ocular conditions. As one of the best examples of this is in the fact that many individuals have been using diathermy over a long period to improve the vision in detachment of the retina. I have not seen or ever heard of a case of detachment that was benefited with diathermy, and it is quite obvious that the only way this condition can be improved, is by other methods, such as electrosurgical intervention.

Reports in the use of diathermy in glaucoma merit further study, but the usually effective ophthalmologic treatments should not be disregarded in any case while physical therapy is applied. To do so in my opinion would be dangerous and criminal.

Dr. Luther C. Peter (Philadelphia): I want to add one word to the papers that have been so well presented, namely, in reference to the use of heat and cold. Heat and cold are used so universally, not only by the ophthalmologist but by all practitioners, that I believe we should have some concrete indications when heat and when cold should be used and the limitations of each. I have always felt that cold should be restricted to traumatic cases and even then for the first twenty-four hours. As pointed out by the essayist, cold, when applied too long, may do damage to the cornea. I also am a believer in the use of cold compresses and not contact with ice. One will never have any serious damage done to the eye tissues if cold compresses are used instead of ice applied directly to the eye. Furthermore, I cannot exactly agree with the essayist on the duration of the effect of heat and cold. Cold should be applied continuously if one expects to get any results, and not intermittently, because the moment the cold, iced compacts are removed, there is a terrific rebound of the vessels and their capillaries.

I would also like to compliment Dr. Ruedemann and his associate in the presentation they made, in their urging of the use of diathermy in our practice. I am afraid we get into ruts and we fail to accept newer thoughts and newer ideas, and surely there are so many cases in which diathermy may be of great value to us. If we are going to use this agent, it is important, of course, that we learn its limitations, dangers, and advantages. As pointed out, too much diathermy may cause damage to the tissues. Therefore, if we use it, and we should use it much more in the future than we have in the past, we must thoroughly master the technic.

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DIATHERMY IN OPHTHALMOLOGY *

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The chief problem in all acute diseases of the eye is to administer immediate treatment to the affected part. It is generally appreciated that the eye does not well tolerate infection or inflammation, so that recovery is usually very poor and visual loss may be great. On the assumption that diathermy offers a medium for immediate treatment, we have used deep heat in sixty patients for nineteen different ocular conditions, which series, although too small for final deduction, offers certain interesting observations.

It is not amiss to state at the outset that we do not use diathermy exclusively in these cases, although in central venous thrombosis and other thrombotic lesions, we believe it is equal to and probably better than most accepted treatments. Five patients with central venous thrombosis have been treated, two of whom were seen early and treatment instituted twice daily. These patients obtained an excellent result, in one the result was only fair, and in two were poor. In two other patients with late venous branch thrombosis absorption appears to have been hastened and the eye was spared a long period of hampered blood supply. One case of orbital thrombosis was materially benefited by making the patient more comfortable. Superficial heat is of little value in deep orbital inflammation, while diathermy was found to be fairly comforting and beneficial. Deep heat was tried in only one patient with arterial closure and it was apparently of little or no value, although if seen early, this form of treatment might prove beneficial.

Some benefit is derived from diathermy in corneal lesions because in five of the six patients treated a good recovery was made, the healing time was lessened, and the patients were much more comfortable.

This treatment has been tried in tarsitis and episcleritis. Two patients with tarsitis were made more comfortable and apparently in one there was some effect in halting the progress of the infection. One patient with herpes zoster and a considerable amount of post-herpetic pain, was considerably relieved during the period she was receiving diathermy.

There were nine patients with the uveal tract involved — either choroiditis, traumatic uveitis, or iridocyclitis. In acute choroiditis, the association with typhoid vaccine therapy may have had some bearing on the end result in that the patient made an excellent recovery, while in those having chronic uveitis, of which there were four, the process was stopped, but deep heat had little or no effect on visual recovery, which was poor.

Two acute cases of infectious iridocyclitis, and two of traumatic uveitis were benefited by deep diathermy.

Patients with lesions of the cornea and acutely inflamed conjunctiva apparently are made more comfortable with deep diathermy although it cannot be used as an isolated form of treatment. The former treatment was also used in one patient with chronic edema of the orbit which could not be diagnosed, and out of two patients having malignant exophthalmos, one was benefited by deep heat to the orbit. In one patient with

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pulsating exophthalmos, apparently no benefit was derived from this or any other form of treatment.

For one patient who had severe vitreous degeneration, treatment was prescribed and apparently there was no effect on the absorption or prevention of further vitreous opacities. (This apparently was a chronic degenerative process and deep heat has no effect on chronic degenerative processes involving the vitreous.)

In post-operative inflammation or infection deep orbital heat is not only comforting to the patient but has a beneficial effect on arresting the progress of the inflammatory process. Diathermy was tried in four patients having retinal detachment in whom we felt no benefit could be obtained by surgery. These either had an exudate in the vitreous or the retina was so severely detached that operative measures could not be attempted. As was to be expected, the results obtained in this group were poor.

There was one individual with optic atrophy due to tertiary syphilis who was also receiving artificial fever therapy. There was probably no lasting benefit although visual improvement was noted.

In acute inflammatory glaucoma, there was some actual beneficial effect. There is more comfort and heat apparently has some tendency to reduce the intraocular tension. In one instance of bilateral acute inflammatory glaucoma subsequent to the use of scopolamine, the vitreous in both eyes was filled with an exudative material, probably blood, and deep heat was used to both eyes with beneficial effect, so that tension was reduced in a short time with restoration of vision in both eyes. One patient with acute inflammatory glaucoma refused an operation. Deep heat was used in conjunction with eserine and vision returned to normal without loss of field.

Heat is of some benefit in acute inflammatory glaucoma and probably of little or no benefit in chronic non-inflammatory glaucoma, although this will have to be tried out in a larger series. Using it on alternate days with typhoid therapy, we have tried it in five cases of retrobulbar neuritis with apparently good results. However, typhoid vaccine has always been of benefit to these patients so we do not know whether the results were secondary to the use of deep heat. Diathermy should be given some credit for the results obtained in this group. We intend to employ this treatment in more ocular conditions both alone and in conjunction with other forms of therapy.

In summing up our study we are led to believe that it would be of benefit in patients having acute inflammatory glaucoma, to lessen the intensity of deep orbital pain. It is of value in cases of orbital and ocular inflammation, especially in the acute stage. It has also proved effective for deep corneal ulcers and in the early cases of central venous thrombosis. Apparently no benefit is obtained in retinal detachment. We have had only four cases of ocular tuberculosis, and they were not benefited by this treatment.

Deep diathermy undoubtedly has a place in ophthalmology. It is an excellent adjunct to conventional treatment, and should be tried in many more cases until the proper field for this form of therapy is established. It surpasses superficial heat in all lesions of the orbit. Very few patients complain of any discomfort and the vast majority are improved. The average number of treatments given, were seven, while as many as 62 have been given to one individual.

Technic

All short wave diathermy treatments were given in the form of electromagnetic induction. The wavelength of the apparatus was 24 meters. Ap-

plication of the cable is simple and convenient. The usual spacing of $\frac{1}{2}$ to $\frac{3}{4}$ inches was obtained by the use of four bath towels' thicknesses. This is obtained by folding two towels once. If one eye is treated the patient lies on his side with the affected eye uppermost. The towels then cover this eye and the side of the face. When both eyes are treated the patient lies on his back and the toweling or padding covers both eyes and extends up over the forehead. The cable is coiled into one loop and is then applied so that it is placed over the eye or eyes to be treated.

It is well known that the eye is a sensitive organ and therefore some judgment must be exercised as to the amount or intensity of heat used. In an inflammatory process congestion is present and adding excessive heat will produce greater congestion and intensify the process and pain. The amount of heat is more or less determined, as in other parts of the body, by the patient's tolerance and reaction. We deem it better to be conservative when these treatments are given and not to attempt to give the patient a dosage to cause discomfort. When one is familiar with the output of his apparatus and the reactions of the patients, the intensity of heat can be easily determined.

When possible, two treatments are given daily, the first early in the forenoon, and the second during the late afternoon. The initial treatment is employed to determine the patient's tolerance and his reaction. The duration of the session is arbitrarily set at 15 minutes and if this is well tolerated the time of the succeeding applications is increased to 20 minutes.

Discussion

Dr. Ramon Castroviejo (New York): For the past five years I have used diathermy extensively in many ocular conditions. My experience is similar to that of Drs. Ruedemann and Zeiter. Like them, I found diathermy of benefit in corneal conditions, conditions of the uveal tract and vitreous opacities. In several cases of retinitis pigmentosa, the patients felt improved, although I was unable to detect any change either in vision or visual fields. In episcleritis and scleritis, grenz ray proved to be more helpful than diathermy. Since it has been claimed by experienced physiotherapists that diathermy has a tendency to increase intraocular tension, I did not dare use it in any type of glaucoma. However, no tendency was found to increase tension in any of the eye conditions that I treated by diathermy. Diathermy was found to be particularly useful for alleviating pain, specially in severe iritis. Of all the electrodes used for ocular diathermy, those of Cepero and Comas have in my experience proved the most effective.

Dr. Joseph I. Pascal (New York): The presentation of Drs. Ruedemann and Zeiter outlining the use of diathermy in nineteen different ocular conditions is certainly replete with interesting and instructive facts. What struck me most is the reported success in the two cases of acute glaucoma. This condition, when for one reason or another, operative procedure is not feasible, is a heartache to the ophthalmologist. Drug therapy, both in scope and efficiency is very limited, and if diathermy offers an effective aid to the few drugs available for this condition it will be a god-send. The report is rather cautious, naturally. I do

hope we shall get more positive information on this phase of physical therapy based on more experimental and clinical findings, at an early date.

Dr. Brown's paper covers the subject of physical therapy in ophthalmology in a delightfully concise and complete manner. There is little I can add to it. His statement that physical therapy is a "neglected . . . mode of treatment," a statement I fully agree with, calls for some comment. I have often wondered why this is so, since physical therapy, aside from its direct beneficial effects, is so much more impressive to the patient than drug therapy. I mean impressive in an ethical sense. In physical therapy the physician actually does something for the patient, that is there is a visible and tangible treatment, not merely writing a prescription or placing a drop of medicine on the eye. This feeling of being actively treated has a wholesome, psychologic effect. It fits in well with the modern conception of treating every organ or part of the body as an integral part of a human personality, embracing both soma and psyche, body and soul.

One phase which has not been mentioned is physical therapy in amblyopia and strabismus, latent and manifest. In orthoptic training, after a period of exercise the use of mild massage and some diathermy is generally soothing to the patient. This phase of eye work may be considered a part of physical therapy, involving as it does the use of various physical agencies and devices, such as lights of different colors, intermittent flashers, revolving discs, and many other physical appliances to stimulate and develop an

amblyopic eye, and to establish binocular fixation and binocular vision. There is no drug therapy for amblyopia associated with strabismus nor for the strabismus of the non-paralytic type. Surgery in the latter condition, is the only means available. But along with it the judicious use of physical therapy and physical devices is very valuable.

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